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Determinants of Netsourcing: An Empirical Evaluation

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ABSTRACT

Among the broad range of outsourcing offerings, netsourcing presents an emerging opportunity in the e-business context. Netsourcing allows companies to selectively source software applications from external providers via the Internet. External providers claim cost advantages over in-house development and operations of software applications. Several research streams on strategy however list a number of arguments from different angles against outsourcing.

We apply a research framework based on two theoretical approaches, strategic management and transaction cost economics, which both have prominently been applied to full IT outsourcing. Surveying the 500 largest companies nationwide, we find an application's competitive relevance, strategic vulnerability, technical specificity, human capital specificity, transaction frequency, and transaction uncertainty to impact a company's decision for or against netsourcing. We conclude with lessons learned, their managerial implications and some topics for further research.

Keywords

Netsourcing Decision, Selective Outsourcing, Strategic Management, Transaction Cost Economics.

INTRODUCTION

Since the beginning of e-business the complexity of and investment in Information Technology (IT) has increased remarkably. Straub and Watson (2001, p.338) state that the "net-enabled organization (NEO) coordinates activities and interacts with its stakeholders through the exchange of messages over electronic networks". Both arguments together lead the way to the emerging e-business trend of netsourcing. Kern et al. (2002, p.1) refer to netsourcing as "the practice of renting or 'paying as you use' access to centrally managed business applications, made available to multiple users from a shared facility over the Internet or other networks via browser-enabled devices". Thereby, netsourcing can be classified as one specific outsourcing subset in the e-business era (Currie, Seltsikas 2001; Desai et al. 2003).

Information systems (IS) outsourcing issues have been addressed by many researchers (e.g., Ang, Cummings 1997; Lee et al. 2003; Dibbern et al. 2004). However, not only in the direct aftermath of the famous Kodak outsourcing deal (Loh, Venkatraman 1995), much of that research stresses full outsourcing of entire departments (e.g., Reponen 1993; Cheon et al. 1995; Slaughter, Ang 1996; Ang, Straub 1998; Willcocks, Lacity 1998; Hancox, Hackney 2000).

In the fragmented palette of outsourcing offerings, selective outsourcing refers to outsourcing of individual IS functions (e.g., maintenance, hosting) or individual IS dominated business processes. Following Davenport (1993, p.5), business processes are "the specific ordering of work activities across time and space, with a beginning, an end, and clearly identified inputs and outputs". Such business processes, comprising major IS elements, are Supply Chain Management (SCM) or Customer Relationship Management (CRM). Similarly relevant are IS applications such as payroll or human resource management (Lacity et al. 1996; Willcocks, Lacity 1998; Lacity, Willcocks 2001).

The advent of Application Service Provision (ASP) illustrated an initial netsourcing business model. It offered the opportunity to externally source selected software applications via the Internet, e.g., eCRM, including their development, hosting, and maintenance (Seltsikas, Currie 2002). Kern et al. (2002) explain netsourcing as a concept subsuming several service provision business models such as application service provision (ASP), operations service providers and solution service providers. Reaching beyond ASPs, netsourcing includes more modular service provision enabled by recent technological developments.

Two recent technological developments, webservices and middleware, have fostered IT modularity and interoperability. Both are necessary for making more modular netsourcing technically feasible, as they allow for selecting services such as databases and application modules from several providers, with the goal of providing one integrated solution (Ferris, Farrell 2003).

But technical feasibility alone does not justify netsourcing, as netsourcing also has a strategic component to it. Drucker (1966) differentiates strategic issues as either efficiency or effectiveness issues, i.e., doing things right versus doing the right things. Applying Drucker's catchy phrase to IS Melville et al. (2004) pose the question whether "the IT resource [is] associated with improved operational efficiencies or competitive advantage". We further detail this question and ask whether the same determinants that were found to be relevant for full outsourcing also apply to netsourcing.

The effectiveness perspective of strategy has often been discussed in strategic management literature. In this context, outsourcing opportunities confront companies with hurdles resulting from diversity and heterogeneity in their IT departments (Dibbern et al. 2004). Both, individual software applications and even entire business processes dominated by IS, such as CRM and SCM, offer strategic value to the sourcing company and present a source of competitive advantage (Porter 1985; Hilmer, Quinn 1994).

The efficiency perspective of strategy has often been associated with transaction cost economics. Traditionally potential outsourcing advantages have been described as production cost savings due to economies of scale on the supplier side (Coase 1937). Transaction costs, however, may countervail production cost savings and thereby endanger a cost savings effect on the client side (Williamson 1979; Williamson 1981).

Those arguments have frequently been raised with regard to outsourcing complete IT departments. We consider them equally relevant to netsourcing decisions, even though, the degree of outsourcing and the granularity of outsourced application modules might change the implications of strategic and economic arguments in the sourcing decision calculus. We aim at investigating whether the strategic value of software applications and transaction costs are determinants of efficiency and effectiveness of the netsourcing decision. We apply a research framework of netsourcing (Loebbecke, Huyskens forthcoming 2006) with seven variables derived from the literature on strategic management and transaction cost economics. Data was gathered in a 2004 survey among the largest 500 companies nationwide.

TOWARDS A NETSOURCING RESEARCH FRAMEWORK

The Netsourcing Decision

The central construct of our netsourcing research framework (see Figure 1) is the netsourcing decision. As elaborated above, we consider netsourcing as selectively sourcing software applications via the Internet from external service providers (Kern et al. 2002) and choose the netsourcing decision as dependent variable. Thus we assume that companies only netsource, if they anticipate an economically positive outcome. Based on this, we can abstract the netsourcing decision from outcome measures such as a performance or success construct (e.g., Venkatraman, Ramanujam 1987; DeLone, McLean 1992; Melville et al. 2004). However, ex ante, outcome measures can only be estimated. Only ex post - following implementation - can outcomes eventually be collected as data.

We investigate determinants regarding their perceived suitability and applicability for practitioners in supporting netsourcing decisions prior to outcome measures being available. Thus, we do not intend to justify a netsourcing decision ex-post by measuring performance advantages or disadvantages. Ex-post analysis implies two major threats: First, judgments of possible determinants could be biased. Misjudgments could present an ex-post justification for poor decision making. Second, available performance measures are global and not restricted to assessments of single applications.

Netsourcing Determinants and Hypotheses Development

As independent variables, we propose determinants based on two research streams, strategic management and transaction cost economics. From the strategic management literature, we select two determinants of strategic value which is a source of competitive advantage. From transaction cost economics, we draw determinants of the production cost versus transaction cost tradeoff. Both research streams have already been applied to and validated for full outsourcing (e.g., Halvey et al. 1996; Ang, Straub 1998; Poppo, Zenger 1998; Hancox, Hackney 2000; Benoit et al. 2004). Compared to full outsourcing, those arguments are hypothesized to have a different impact on netsourcing. Concerning full outsourcing, strategic risks and transaction costs caused by a few critical applications could outweigh the cost savings and flexibility gained from the majority of outsourced applications. Netsourcing in contrast is assessed based on an application's individual net effect. This

means every application or application module with a positive net effect would need to be selectively outsourced. All seven independent variables and the respective hypotheses are illustrated in Figure 1.

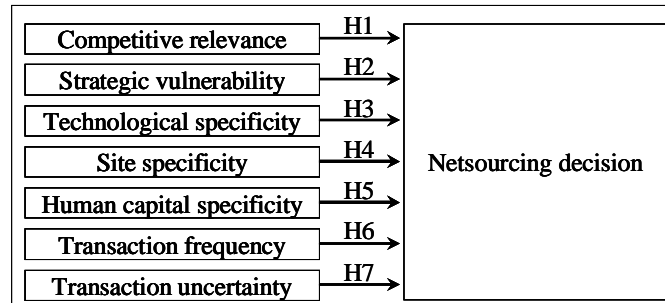


Figure 1. Independent variables and hypotheses related to netsourcing

Strategic management literature conveys that a few distinct capabilities differentiate companies from competitors (Hamel, Prahalad 1990; Grant 1991; Kay 1993). Such capabilities could be, for instance, management of customer data or management of supply chain partners. Software applications potentially contain such capabilities and thereby differentiate companies from competitors. However, the strategic relevance differs among software applications. While some applications are considered to be a commodity, others such as ERP software are attributed a competitive relevance. Strategically relevant applications may vary from organization to organization. Companies do not replace strategically relevant software applications with standardized off-the-shelf applications offered by external providers with a one-to-many business model (Hilmer, Quinn 1994; Willcocks, Lacity 1998). Different from full outsourcing opportunities, netsourcing offers companies the opportunity to take advantage of some outsourcing despite strategic relevance in selected applications.

H1: Software applications of companies that netsource have significantly less competitive relevance than those that do not netsource.

A competitive advantage may also originate in a distinct capability that drives an entire business process such as SCM or CRM. A competitive advantage in a business process often results from collaboration across several company departments. Selectively outsourcing one element of such a business process, i.e., one software application, may risk the outcome of the entire process (Hilmer, Quinn 1994; Jurison 1995; Loh, Venkatraman 1995). The software application causes strategic vulnerability. With full outsourcing, vulnerability - caused by any software application - entirely excludes a company from taking advantage of outsourcing advantages. With netsourcing, in contrast, a company can differentiate between applications and benefit from outsourcing those selected applications which do not cause vulnerability.

H2: Software applications of companies that netsource expose the company to significantly more strategic vulnerability than those of companies that do not netsource.

The cost perspective also plays a role in netsourcing. Production costs are generally assumed to decrease due to outsourcing induced economies of scale on the supply side (Lacity, Hirschheim 1993; Kern et al. 2002). Transaction costs arise as a result of finding, managing, and controlling external service providers (Barthelemy 2001). An organization will favor outsourcing if the production cost savings outweigh the transaction cost induced expenses (Ang, Straub 1998). As the extent of transaction costs in this trade-off is determined by certain transaction cost drivers, we develop five hypotheses derived from those, H3 to H7:

The software portfolio of a company contains commoditized applications (e.g., mail client, spreadsheet software) and customized ones (e.g., ERP software). In transaction cost economics, asset customization and even individualization are discussed under asset specificity (Klein et al. 1978). Within asset specificity, Williamson (1985) distinguishes technical, human resource, and localization components.

Externally, sourcing customized applications offers some economies of scale from central hosting and maintenance. However economies of scale play only a minor role in developing customized applications if each individual application is either developed from scratch or needs at least major customization work. Applications are either developed upon request by external service providers, or they are developed in-house and then delivered to the outsourcing company for service provision. We subsume application customization under the term technical specificity. Further, we hypothesize that technical specificity has a negative influence on netsourcing (Stuckey, White 1993).

H3: Software applications of companies that netsource are significantly less customized than those of companies that do not netsource.

Software applications can run either on a client or a server. Server based applications are accessed remotely either via a specific client or via a common web browser. Long distances may occur between client and server. Network security, network reliability and network control could cause a reasonable threat due to customer site specificity and thus attribute negative net cost effects to externally sourced applications (Stuckey, White 1993). Corresponding to the heterogeneity of a company's software applications, their negative cost effects vary. Netsourcing allows for selectively outsourcing those applications whose outsourcing benefits outweigh the net cost effects.

H4: Software applications of companies that netsource are significantly less customer site specific than those of companies that do not netsource.

A company's IT department acquires, trains, and holds specific human capital (Stuckey, White 1993; Nam et al. 1996) for developing and maintaining software applications. Especially for development purposes, the staff accumulates process know-how beyond general IT knowledge. In case such specific human capital is required for software development and maintenance, netsourcing may be denied (Dibbern et al. 2005).

H5: Software applications of companies that netsource require significantly less specific human capital than those of companies that do not netsource.

Especially when netsourced, the transaction frequency with regard to software applications results from the frequency of adaptations made to the software or its underlying contracts. Software adaptations, however, do not only result from the application specifications, but also from overall business process adaptations. Consequently, companies may decide not to netsource applications with a high transaction frequency owing to business process adaptations (Poppo, Zenger 1998).

H6: Business processes of companies that netsource show significantly less need for adaptations than processes of those that do not netsource.

Governing development, hosting, and maintenance externally adds costs due to transaction uncertainty when no direct control is possible (Klein et al. 1978; Poppo, Zenger 1998). Such indirect performance measurement may exert prohibitively high costs. For those reasons, netsourcing may depend on the level of transaction uncertainty (Benoit et al. 2004).

H7: Software applications of companies that netsource inherit significantly less transaction uncertainty than applications of those that do not netsource.

METHODOLOGY

To test the seven hypotheses, we conducted a survey on the 500 largest companies nationwide based on total sales. From the alphabetical list of 500, we systematically drew a sample (Cochran 1977) of 333 companies by choosing one of the first three from the alphabetical list by lot and successively picking further entrants with an interval of three. This resulted in 167 sample entrants. The procedure was then reiterated drawing further entrants with an interval of two from the remaining list. From those 333 companies we eliminated 41 from the list due to a shared IT department with the parent company also included in the sample. Furthermore, 54 companies were eliminated from the list as they could not be contacted. We ended up with 238 companies for our survey research.

Within each of the 238 sample companies, we contacted the Chief Information Officer or the IT manager - whoever was in charge of IT decisions. We developed a questionnaire, which contained one binary coded [yes = 0; no = 1] question on the company's netsourcing activities and seven statements, one for each independent variable. As scale for assessing the statements, we used a 5 point Likert scale. The questionnaires were sent out by mail or fax and - if they did not answer within 21 days - also called potential respondents by phone. The procedure resulted in 88 replies which calculated to a response rate of almost 37%.

To assure the sample validity and to decrease the risk of a non-respondent bias, we conducted a t-test comparing respondents with non-respondents. We compared total sales and the number of employees of each company (Teng et al. 1995; Lee et al. 2004). The underlying hypothesis was that there was a difference of means. The absence of a non-respondent bias could be assumed if an existing difference of means was indicated by a significant t-statistic ($SIGT > 0.05$).

We also chose a t-test for testing the research hypotheses. The t-test compares the means of two independent samples and calculates its significance. By separating companies that netsourced from those that did not netsource, we obtained two sufficiently independent sub-samples.

Before proceeding, besides the independency of samples, two assumptions of the t-test had to be confirmed (Gardner 1975), normal distribution within both samples and homoscedasticity.

For measuring the approximation to a normal distribution, we calculated a Shapiro-Wilk test (instead of a Kolmogorov-Smirnov test) due to the relatively small sample size. The assumption of a normal distribution is confirmed if the Shapiro-Wilk *W*-statistic is close to 1 and insignificant ($SIGSW > 0.05$).

We checked for homoscedasticity, i.e. for a similar variance among the distributed variable in both samples, by calculating differences of variances between the sub-samples using the Levene's test. Homoscedasticity can be assumed if the difference in variance is insignificant ($SIGL > 0.05$).

Finally, we considered a research hypothesis to be confirmed if the means of the two samples were significantly different ($SIGT < 0.10$) and the direction of the difference of means corresponded with the hypothesis.

RESULTS

As explained above, we divided the respondents in two sub-samples, companies that netsourced and those that did not netsource. Concerning the validity of our sample, no non-response bias was discovered as the t-statistic was insignificant for total sales ($SIGT = 0.828 > 0.05$) and number of employees ($SIGT = 0.912 > 0.05$).

	Netsourcing (N=54)		No Netsourcing (N=34)	
	W	Sig.	W	Sig.
competitive relevance	0.867	0.000	0.891	0.003
strategic vulnerability	0.902	0.000	0.881	0.001
technical specificity	0.892	0.000	0.869	0.001
site specificity	0.889	0.000	0.854	0.000
human capital specificity	0.907	0.010	0.878	0.001
transaction frequency	0.892	0.000	0.904	0.006
transaction uncertainty	0.898	0.000	0.912	0.010

Table 1. W-statistic testing normal distribution within netsourcing sub-samples

With regard to reliability of the method related to our sample data, we checked the two assumptions of the t-test, normal distribution and homoscedasticity, as described in the methodology section. The Shapiro-Wilk *W*-statistic showed values close to 1. The lowest *W*-value within both sub-samples was $W > 0.85$. Even though showing sufficient *W*-values, it was not insignificant (see Table 1).

The Levene's test showed an insignificant *F*-statistic for the relationship between each pair of factors (see Table 2), indicating that there was no significant difference of variance between the companies that netsource and those that do not.

	F	Sig.
competitive relevance	2.321	0.131
strategic vulnerability	2.093	0.152
technical specificity	2.331	0.130
site specificity	0.281	0.598
human capital specificity	0.000	0.987
transaction frequency	0.000	0.994
transaction uncertainty	0.149	0.701

Table 2. Homoscedasticity between netsourcing sub-samples

The t-test of independent samples for checking our seven research hypotheses are depicted in Table 3.

Concerning the strategic management determinants, competitive relevance and strategic vulnerability, the mean value was significantly lower for companies that netsourced than for those that did not netsource (H1 and H2 confirmed). The same held true for four out of five transaction cost determinants. Technical specificity, human capital specificity, transaction frequency, and transaction uncertainty had significantly lower means for companies that netsourced compared to those that did not netsource (H3, H5, H6, and H7 confirmed). However, technical specificity and transaction frequency showed lower significance ($\text{SIGT} < 0.10$), i.e. a lower, but still acceptable explanatory power. Only site specificity did not show any significantly lower mean for the netsourcing sub-sample compared to the sub-sample that does not netsource (H4 not confirmed).

		Netsourcing (N=54)		Not Netsourcing (N=34)				
		Mean	S.D.	Mean	S.D.	T	Hypothesis	Supported
competitive relevance		2.44	1.110	3.38	1.326	-3.577 ***	H1	Yes
strategic vulnerability		2.65	1.067	3.53	1.237	-3.547 ***	H2	Yes
technical specificity		2.54	1.224	3.03	1.507	-1.678 *	H3	Yes
site specificity		3.44	1.040	3.68	1.199	-0.960	H4	No
human capital specificity		3.00	1.213	3.53	1.187	-2.010**	H5	Yes
transaction frequency		3.04	1.009	3.41	0.988	-1.710*	H6	Yes
transaction uncertainty		2.69	1.006	3.32	1.065	-2.833***	H7	Yes
***	significant at Sig < 0.01			S.D.	Standard Deviation			
**	significant at Sig < 0.05			H	Hypothesis			
*	significant at Sig < 0.10							

Table 3. T-test on difference of means among netsourcing sub-samples

MAJOR FINDINGS

We found support for both strategic management determinants and for four out of five transaction cost determinants; they were identified as crucial to netsourcing.

What did we learn with regard to the strategic management determinants?

Companies that netsourced ascribed the source of competitive advantage within a process less to software applications than those companies that did not netsource. Similarly, companies that avoided netsourcing feared more strategic vulnerability resulting from netsourcing than those that netsourced. The threat of decreasing strategic value of software applications and the loss of competitive advantage negatively influenced netsourcing. Those findings validate the strategic management findings from full IT outsourcing for netsourcing.

And what could we conclude regarding the transaction cost determinants?

Two out of three factors related to asset specificity play a major role in netsourcing. Companies that netsourced tended to have less customized software applications and less specific development and maintenance know-how than companies that did not netsource. However, companies with a need for especially skilled personnel and specifically customized software applications netsourced less. Site specificity, the remaining asset specificity factor, however, seemed less relevant.

The location of the hosting site did not play a restraining role as determinant of netsourcing. This can be explained by the distributed nature of corporate IT networks. Global companies that operate applications on central servers and access the application with a client from any place in the world, did not seem to regard the hosting site as critical. However, our instrument did not take into account the perceived distance caused by governing structures, an issue which is also considered relevant when pondering netsourcing advantages.

The frequency of software and contract adaptations and the cost associated with these adaptations played a role in the trade-off between production cost and transaction cost. In this context, we found that adaptations occurred less frequently in companies that netsourced compared to those that did not. Transaction uncertainty also had an influence on transaction cost.

Incorporating imperfect and costly control mechanisms it was found to be less important to netsourcing companies compared to ones not netsourcing.

Overall, transaction costs for searching, managing, and controlling the sourcing relationship may outweigh production cost savings of. The trade-off is determined by (1) the degree to which the software application and the required personnel are company-specific, (2) the necessary frequency of software adaptation as laid out in the contract, and (3) the perceived level of uncertainty the netsourcing relationship yields.

LESSONS LEARNED AND MANAGERIAL IMPLICATIONS

Strategic value of a software application presents a determinant to netsourcing. From a strategic management perspective the application's suitability for netsourcing can merely be determined by evaluating its strategic value, but cannot be influenced by either party. This holds several managerial implications:

Internal ranking of applications according to their strategic value and comparing own applications to ones operated by competitors (benchmarking) is needed. If such an analysis yields either strategic relevance of an application, or strategic vulnerability caused by an application, or a combination of both, the application's strategic value is established and caution about netsourcing seems appropriate.

Netsourcing service providers should assist the benchmarking process by providing the sourcing company with industry data and consulting efforts.

Asset specificity as a whole has divergent effects on netsourcing. On the one hand the requirement of company-specific process know-how and the presence of individually developed and maintained software applications both act as determinants of netsourcing. On the other hand the hosting location does not serve as a good indicator for netsourcing suitability; neither signals remote hosting appropriateness, nor points in-house hosting at inappropriateness of netsourcing. This holds the following implications for managers:

The need of company-specific know-how for development or maintenance is not a matter of influence by any party involved. So, besides identifying such applications, neither the sourcing company, nor the service provider can enhance the suitability of an application for netsourcing.

Service providers should be taken into consideration regardless of their location. Netsourcing from offshore locations becomes attractive. Especially in the e-business era, offerings from economically emerging regions may offer production cost advantages which outweigh transaction costs.

Transaction frequency depicting adaptations to an inter-organizational business process poses an important transaction cost determinant. Therefore, a high frequency of adaptations in the past should be an indicator to reconsider netsourcing. Transaction frequency can cooperatively be influenced by both parties. For managers this means:

Adaptations to applications and the underlying service agreements should be designed and clearly outlined as standard processes at the initiation stage of the project. Thus service providers and the netsourcing organization could avoid cost explosions due to non standardized adaptation procedures.

Transaction uncertainty, due to imperfect control mechanisms, externally imposes an inhibiting influence on netsourcing. While applications with easily measurable results can be considered for netsourcing, those suffering from complex and indirect measures ought to be handled with care. Transaction uncertainty can be reduced if both parties, i.e., the sourcing company and the service provider, cooperate. Specifically, this implies for the service management:

Reporting tools and further cooperative control mechanisms should be installed from the beginning of the project.

Service agreements should contain incentive structures that pay tribute to the uncertainty and help avoid performance shortfalls due to moral hazard.

SUMMARY AND FURTHER RESEARCH

Netsourcing, an IT outsourcing phenomenon of the e-business era, describes selectively sourcing software applications via the Internet. In our project, we investigated whether the same determinants apply to netsourcing as to full IT outsourcing. We applied a netsourcing research framework with independent variables from strategic management and transaction cost economics, both dominant theoretical approaches to full IT outsourcing. Then, we statistically analyzed data from a survey conducted among a sample of the 500 largest companies nationwide.

We found determinants from strategic management as contributing to a strategic value and four of five determinants from transaction costs standing for an asset's specificity as well as the uncertainty and frequency of a transaction to be playing a major role in the netsourcing decision.

Our research offers insights for practitioners about relevant netsourcing determinants. Practitioners could derive actions from those insights with the objective to influence and alter parameter values of determinants prior to netsourcing. It suggests to assess each application individually and subsequently decide on its suitability for selective outsourcing via the Internet depending on the application's strategic value and the anticipated cost effects from netsourcing. Further, it holds the implication that netsourcing to offshore locations is not detrimental compared to in-house operation or on-shore outsourcing.

We only took a first step towards a comprehensive netsourcing model. Our results may seem intuitive as they are identical to full outsourcing findings. Nevertheless, the contribution of this paper lies in identifying relevant determinants and establishing the direction of their influence on netsourcing.

A larger sample that allows for additional statistical analysis would further validate current intermediate insights. Besides, surveying also small and medium-sized companies (SMEs) should provide additional insights with regard to personnel, resources, and other contextual factors.

Digging deeper into the theoretical basis of outsourcing could deliver additional determinants and antecedents that add to the comprehensiveness of the netsourcing model. Also, further exploring the measures of influence and possible interdependencies of the determinants enhances the structure and precision of the model. With regard to transaction cost, the perceived distance caused by governing structures may be introduced as complementary to mere physical distance.

Also, the construct 'netsourcing decision' could be fine-tuned. Applying a performance construct as dependent variable would allow for more precise evaluations of netsourcing. However, introducing a posterior evaluation of the determinants by the respondents might cause some common method bias which could negatively outweigh the current assumption of 'rational decision making'.

Finally, further research could differentiate determinants of selective application outsourcing from those of business process or infrastructure outsourcing.

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